BASELINE ECOLOGICAL RISK ASSESSMENT STRATEGY FOR THE TVA KINGSTON FLY ASH RECOVERY PROJECT

S. Young¹, D. Jones¹, N. Carriker², M. Stack³ ¹ ARCADIS, Knoxville, TN; ² Tennessee Valley Authority, Kingston Ash Recovery Project, Kingston, TN; ³ Jacobs, Oak Ridge, TN

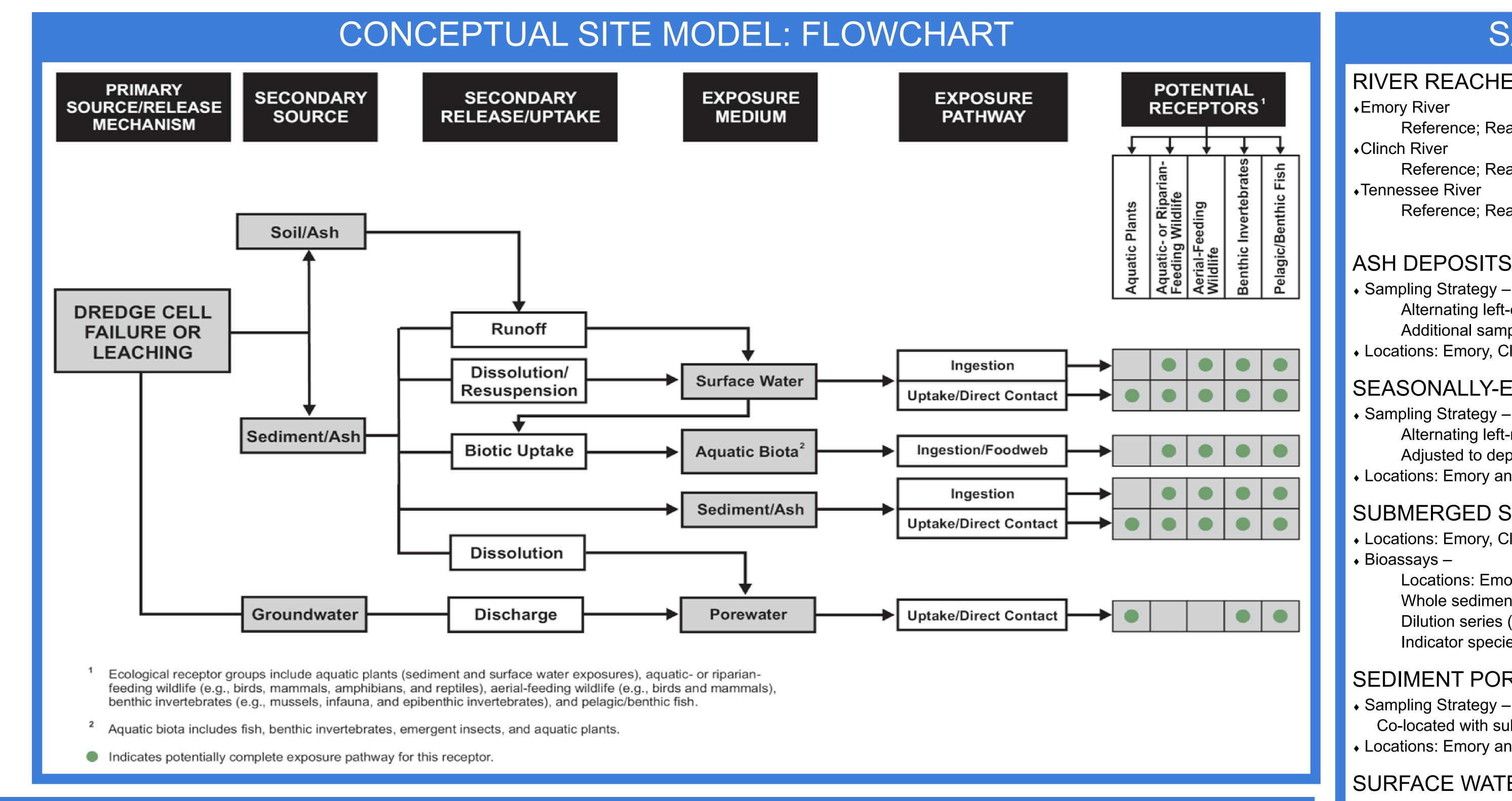
ABSTRACT

The release of fly ash at the Tennessee Valley Authority (TVA) Kingston Fossil Plan (KIF) on December 22, 2008 discharged approximately 5.4 million cubic yards of coasts ash slurry into the adjacent aquatic and terrestrial systems. The initial response focuse on public protection and stabilization of the released ash, but rapidly evolved to includ comprehensive monitoring of ambient media and ecological receptors. Metals and metalloids, including arsenic and selenium, are the primary constituents of potential concern for fly ash.

KIF is located on the Emory River near the confluence of the Clinch and Tennesse livers. This portion of the Tennessee River Valley is bounded by ridges and impounded y Watts Bar Dam, a multi-use reservoir that supports a diversity of aquatic and errestrial wildlife. A Conceptual Site Model (CSM) was developed to summarize and llustrate the ecological receptors and potential exposure pathways associated with the Kingston fly ash release. The size and complexity of the potentially affected ecosystem ecessitates a comprehensive environmental monitoring program, which TVA is performing in cooperation with numerous federal, state, and academic organizations.

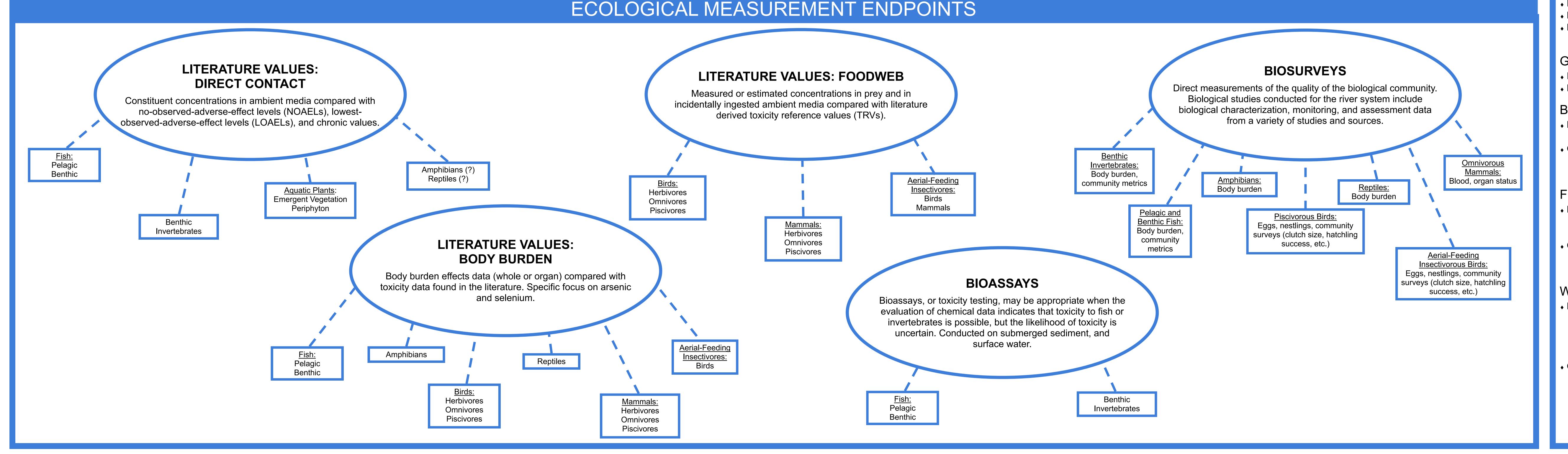
The Screening Level Ecological Risk Assessment (SLERA) indicated that a Baseline Ecological Risk Assessment (BERA) is warranted for the River System into which the ash was released. The direct exposure pathways being evaluated for the River Syste nclude exposures to ash as sediment, sediment porewater, groundwater discharging to surface water, surface water, and seasonally-exposed sediment. Dietary exposures are lso a concern for some ash-related constituents, including arsenic and selenium. Th ecological receptors for which bioaccumulation and food web pathways are bein studied at this site include fish, benthos, emergent insects, piscivorous birds and nammals, aerial-feeding insectivores, herbivorous birds, omnivorous mammals amphibians, reptiles, and others. The BERA strategy presented in this poster was used to develop data quality objectives for the River System Investigation and identify additional data needs. The CSM and BERA Strategy were then used to refine the umerous field and laboratory studies being performed or supported by TVA, many of which are presented in this poster session.

CONCEPTUAL SITE MODEL: PICTOGRAPH Aerial-Feeding Birds and Mammal Surface Water and Seasonally-Exposed Sediment Piscivorous Mammals Aquatic Plants GROUNDWATER Discharge to Surface Water



ASSESSMENT ENDPOINTS

- Pelagic Fish
- Benthic Fish Benthic Invertebrates
- 4: Aquatic Plants
- 5: Aquatic- or Riparian-Feeding Herbivorous Birds (wood duck; *Aix sponsa*)
- 6: Aquatic- or Riparian-Feeding Omnivorous Birds (mallard; *Anas platyrhynchos*)
 - (killdeer; Charadrius vociferous)
- : Aquatic- or Riparian-Feeding Piscivorous Birds (osprey; *Pandion haliaetus*)
- (great blue heron; *Ardea herodias*)
- 8: Aquatic- or Riparian-Feeding Herbivorous Mammals
- (muskrat; Ondatra zibethicus)
- 9: Aquatic- or Riparian-Feeding Omnivorous Mammals
- (raccoon; *Procyon lotor*)
- 10: Aquatic- or Riparian-Feeding Piscivorous Mammals (mink; Neovision vision)
- 11: Aerial-Feeding Insectivorous Birds
- (tree swallow; *Tachycineta bicolor*)
- 12: Aerial-Feeding Insectivorous Mammals
- (gray bat; *Myotis grisescens*)
- 13: Aquatic- or Riparian-Feeding Reptiles14: Aquatic- or Riparian-Feeding Amphibians



SAMPLING PLAN SUMMARY

RIVER REACHES:

Alternating left-center-right of channel Additional samples for larger coves

Locations: Emory, Clinch, and Tennessee Rivers

SEASONALLY-EXPOSED SEDIMENT: ▲ Sampling Strategy –

- Alternating left-right of channel
- Adjusted to depositional areas
- Locations: Emory and Clinch Rivers

SUBMERGED SEDIMENT:

Locations: Emory, Clinch, and Tennessee Rivers

Locations: Emory and Clinch Rivers

Whole sediment samples

Dilution series (100%, 75%, 50%, 25%, 0%) Indicator species: H. azteca, C. dubia, C. tentans

SEDIMENT POREWATER:

Sampling Strategy –

- Co-located with submerged sediment bioassay tests
- Locations: Emory and Clinch Rivers

SURFACE WATER:

- Epibenthic and mid-column water depths
- Locations: Emory, Clinch, and Tennessee Rivers
- Indicator species: C. dubia, P. promelas

GROUNDWATER:

Installation of new wells

Modeling of groundwater discharge to Emory River

BENTHIC INVERTEBRATES:

- Bioaccumulation Studies –
- Snails, Mayflies (nymphs and adults)
- Community Surveys
 - Benthic invertebrate community metrics Locations: Emory, Clinch, and Tennessee Rivers

Bioaccumulation Studies -

Largemouth bass, bluegill, channel catfish, gizzard shad, threadfin shad Locations: Emory and Clinch Rivers

Community Surveys – Fish community metrics

Locations: Emory and Clinch Rivers

WILDLIFE AND AQUATIC VEGETATION:

Bioaccumulation Studies –

Tree swallow and great blue heron eggs/nestlings Locations: Nest colonies on the site

Emergent vegetation and periphyton

Locations: Emory, Clinch, and Tennessee (emergent only) Rivers

Community Surveys –

Tree swallow and great blue heron Evaluating: clutch size, hatchling success, physical conditions

Locations: Nest colonies on the site